

Remarks/Arguments:

Introduction

Claims 5-12, 14-22 and 25 are pending. Claims 12 and 14-22 are withdrawn. Claims 1-5, 23 and 24 are canceled. Claims 9 and 10 have been amended. Claim 25 has been added to describe that the end face of the pin is flat.

No new matter is introduced with the amendments. Entry of the claim amendments is respectfully requested.

Section 112 Rejections

Claims 5-11 were rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. Applicant respectfully submits that with the amendments presented herein, the Section 112 rejections are obviated.

Reconsideration and withdrawal of the Section 112 rejections are respectfully requested.

Section 102/103 Rejections

Claims 5-7, 10 and 11 were rejected under 35 U.S.C. § 102(b) and claim 8 was rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over US 816,470 to Higgins (hereinafter "Higgins"). Applicant respectfully traverses.

The Examiner alleges that claims 5 to 7 and 11 are anticipated by Higgins. Higgins, however, fails to disclose, teach or suggest, *inter alia*, "two deflectors [that] converge towards the aperture to produce a flat spray pattern which is substantially parallel to the head", as set forth in amended independent claim 10. (emphasis added). In particular, the below discussion of the shape of the exit aperture in Higgins and Higgins' impingement of liquids to create flat jets clearly show that Higgins fails to disclose, teach or suggest the present invention.

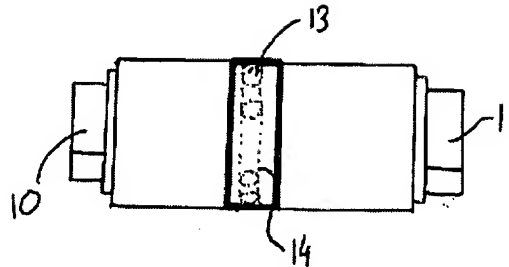
Shape of Exit Aperture in Higgins

It is respectfully submitted that one of ordinary skill in the art seeking to create a flat jet nozzle based on the disclosure in Higgins is given little guidance as to the shape of the aperture at the end of through passage 7 of Higgins. This aperture has no reference number in Higgins and is not discussed in the body of the specification. For the sake of clarity it will be referred to here as the "exit aperture".

None of the Figures in Higgins provide an end view of the nozzle 5, showing the shape or size of the exit aperture. One of ordinary skill in the art must therefore rely on the description in Higgins in order to devise the correct size and shape of the exit aperture. Indeed, one of ordinary skill in the art would refer to Higgins's earlier US Patent 724,008 as taught by Higgins at page 1, line 42 of the 816,470 patent to Higgins).

It is respectfully submitted that one of ordinary skill in the art would readily appreciate that in order for the discharge passages 13, 14 in the plugs 10, 11 to function the exit aperture must not cover these passages. Both an elongated discharge passage 14 and divided discharge passages 13 in the plugs are disclosed. If either of these passages in the plugs were blocked then the "divided spray" (Higgins, page 1, line 82) or "flattened" discharge (Higgins, page 1, line 85) would simply not be created.

In order for the fuel to flow through the passages 13, 14 of Higgins in the desired fashion the exit aperture must be of an adequate size and shape to facilitate these desired flow patterns. One of ordinary skill, in the art would readily devise a slot-like exit aperture like that shown as a thickened line on the nozzle end view (below) in order to allow fuel to discharge from passages 13 and 14 (shown with dashed lines).



On reading Higgins in light of US 724,008, one of ordinary skill in the art would also determine that “the inlet 3 and outlet 4 passages... are arranged out of alignment or in dissimilar planes, so that the fluids or vapors entering the inlet passages will be directed against the interior walls of the nozzle... so that a more efficient commingling... will be effected”. (US 724,008, page 1, lines 20 to 27). On observing that the receiving apertures 6 of Higgins are located out of alignment with passage 7 between the plugs, one of ordinary skill in the art would be further encouraged to provide a slot-like exit aperture like that shown in the drawing above:

It is respectfully submitted that, if one of ordinary skill in the art were to devise a nozzle with a flat spray pattern in accordance with Higgins, the spray pattern would necessarily be transverse to the axis of the plugs 10, 11 of Higgins. As such, Higgins does not disclose, teach or suggest a nozzle that produces a “flat spray pattern which is substantially parallel to the head” of the T-piece as required by the new claim 10 of the present application. It is therefore submitted that claim 10 is patentably distinct over Higgins.

It is submitted that Higgins teaches that a slot-like exit aperture is required like that shown in the drawing above in order to generate the desired spray patterns from the passages 13, 14 in the plugs. As such, the “pipe” does not provide an internal curvature which can act to deflect fuel in passage 7. In fact, the “pipe” in Higgins cannot act to deflect the fluid as the formation of a slot-like exit aperture results in removal of the very material that could provide such deflection.

Accordingly, Higgins fails to disclose, teach or suggest the present invention.

Impingement of Liquids to create Flat Jets

Higgins relates to a nozzle for spraying an oil and steam mixture. (Higgins, page 1, lines 40 to 52). It is submitted that, given the presence of the steam, such a mixture would behave as a compressible gas, at least for the purposes of determining how it would pass through a nozzle.

Nozzles designed for liquids and gases do not share the same properties. Given the compressibility of gas, the gas behaves differently when it is released into atmospheric conditions as compared with liquids such as water, which are not compressible.

It is submitted that the use of “impingement” deflectors to create a flat jet is a feature of liquid nozzles; and not gas nozzles. The “two deflectors that converge toward the aperture to produce a flat spray pattern” as claimed in claim 1, are an example of the use of impingement to create a flat jet.

A flat jet nozzle concentrates the liquid in a thin line. Simply having a slot without converging walls will not cause a liquid to impinge forming a flat spray pattern consisting of individual water particles. If a liquid were to be run through the slot between the plugs in Higgins the liquid would initially form a solid stream in the shape of the slot but would rapidly reform into a round stream. A gas on the other hand would exit the slot in the shape of the slot and continue to expand maintaining substantially the same profile as the slot.

Displacement of the pins in the nozzle of the subject application changes the volume of flow not the shape of the exit plume which remains flat in a thin line. In contrast, rotation of the plugs in Figures 3 and 4 of Higgins results in a variety of changing plume shapes.

In summary, Higgins fails to disclose, teach or suggest the use of two deflectors that converge toward an aperture to produce a flat spray pattern, as claimed in the present application because Higgins is related to a gas nozzle not a liquid nozzle, and in any case the claimed deflectors are not disclosed by Higgins.

Accordingly, Higgins fails to disclose, teach or suggest the present invention.

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Reconsideration and withdrawal of the rejection of the claims under Sections 102(b) and 103(a) are respectfully requested.

Summary

Therefore, Applicants respectfully submit that independent claim 10, and all claims dependent therefrom, are patentably distinct. Further, rejoinder and allowance of claims 12 and 14-22 are respectfully requested. This application is believed to be in condition for allowance. Favorable action thereon is therefore respectfully solicited.

Should the Examiner have any questions or comments concerning the above, the Examiner is respectfully invited to contact the undersigned attorney at the telephone number given below.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication, or credit any overpayment, to Deposit Account No. 08-2461. Such authorization includes authorization to charge fees for extensions of time, if any, under 37 C.F.R. § 1.17 and also should be treated as a constructive petition for an extension of time in this reply or any future reply pursuant to 37 C.F.R. § 1.136.

Respectfully submitted,

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